

This listing of claims will replace all prior versions, and listings, of claims in the application:

Claim 1 (canceled)

- 1 Claim 2 (previously presented): The method of claim 11
- 2 wherein the path is a label-switched path.

- 1 Claim 3 (previously presented): The method of claim 11
- 2 wherein the message is a resource reservation protocol PATH
- 3 message.

Claim 4 (canceled)

- 1 Claim 5 (previously presented): A method for processing, by a node of a network, a message from another node of the network, the message carrying at least one network path determination constraint, the method comprising:
 - 5 a) performing a constraint-based path determination to a next node to generate a partial path; and
 - 6 b) forwarding the message carrying the at least one network path determination constraint to an adjacent downstream node on the partial path,
- 10 wherein the at least one network path determination constraint is expressed in the form of a program including one or more executable instructions.

- 1 Claim 6 (previously presented): A network node comprising:
 - 2 a) a path determination facility for performing a constraint-based path determination to a next node to generate a partial path; and
 - 3 b) a signaling facility for

6 i) receiving a message from another node of the
7 network, the message carrying at least one
8 network path determination constraint, and
9 ii) forwarding the message carrying the at least
10 one network path determination constraint to an
11 adjacent downstream node on the partial path,
12 wherein the at least one network path
13 determination constraint is expressed in the form of a
14 program including one or more executable instructions.

Claim 7 (canceled)

1 Claim 8 (previously presented): The method of claim 11
2 wherein the at least one network path determination
3 constraint includes a list of at least one explicit node
4 specified to be a part of the path.

1 Claim 9 (original): The method of claim 8 wherein the list
2 of at least one explicit node specified to be a part of the
3 path identifies at least one of a strict-hop node and a
4 loose-hop node.

1 Claim 10 (original): The method of claim 8 wherein the
2 message forwarded to the adjacent downstream node on the
3 partial path includes an updated list, and
4 wherein the node maintains the initial instance
5 of the list, as received.

1 Claim 11 (previously presented): A method for processing,
2 by a node of a network, a message from another node of the
3 network, the message carrying at least one network path
4 determination constraint, the method comprising:

5 a) performing a constraint-based path determination
6 to a next node selected from a group of nodes
7 consisting of
8 (i) an area border node,
9 (ii) an autonomous system gateway node,
10 (iii) a node that can process one of the at least
11 one network path determination constraint carried
12 by the message which the present node cannot, or
13 will not, evaluate,
14 (iv) a specified loose-hop node, and
15 (v) a node to which constraint processing is
16 delegated,
17 to generate a partial path; and
18 b) forwarding the message carrying the at least one
19 network path determination constraint to an adjacent
20 downstream node on the partial path, or to a delegated
21 node that is able to carry out the path determination,
22 wherein the at least one network path determination
23 constraint is expressed in the form of a program including
24 one or more executable instructions.

1 Claim 12 (original): The method of claim 11 wherein each
2 executable instruction includes:
3 - information about a first operand;
4 - information about a second operand; and
5 - an operation code.

1 Claim 13 (original): The method of claim 12 wherein the
2 operation code identifies an operation selected from a
3 group of operations consisting of:
4 - bit-wise AND;
5 - bit-wise OR;

6 - bit-wise XOR;
7 - bit-wise equality;
8 - bit-wise inversion;
9 - Boolean AND;
10 - Boolean OR; and
11 - Boolean negation.

1 Claim 14 (original): The method of claim 12 wherein the
2 information about either of the first operand or the second
3 operand is a pointer to a register.

1 Claim 15 (original): The method of claim 14 wherein the
2 register is a register which contains a link attribute.

1 Claim 16 (original): The method of claim 14 wherein the
2 register is a read-only register.

1 Claim 17 (previously presented): The method of claim 11
2 further comprising:
3 - generating a list which specifies nodes on the
4 partial path as strict hop nodes; and
5 - forwarding the list to an adjacent downstream node
6 on the partial path.

1 Claim 18 (original): A method for processing, by a node of
2 a network, a message carrying at least one network path
3 determination constraint, the method comprising:
4 a) determining whether the node is a tail-end node, a
5 head-end node, or an intermediate node of the path;
6 b) if it is determined that the node is a tail-end
7 node and each of the at least one network path
8 determination constraint has been satisfied, then

9 signaling back to an upstream node of the path that
10 the path is OK;
11 c) if it is determined that the node is one of a
12 head-end node and an intermediate node, then
13 i) determining whether (a) a strict-hop node is
14 specified as a next node of an explicit path
15 constraint, (b) a loose-hop node is specified as
16 a next node of an explicit path constraint, or
17 (c) no node is specified as an explicit path
18 constraint,
19 ii) if a strict-hop node is specified as a next
20 node of an explicit path constraint, then
21 A) applying each of the at least one
22 network path determination constraint to an
23 appropriate one of a link between the node
24 and the strict-hop node, the strict-hop
25 node, and the partial path defined,
26 B) if each of the at least one constraint
27 is satisfied, then forwarding a message
28 carrying the at least one network path
29 determination constraint to the strict-hop
30 node, and
31 C) if any one of the at least one
32 constraint was not satisfied, then signaling
33 a path error back to an upstream node,
34 iii) if one of (a) a loose hop node is specified
35 as a next node of an explicit path constraint or
36 (b) no node is specified as an explicit path
37 constraint, then
38 A) performing a constraint-based path
39 determination to a next node selected from a
40 group of nodes consisting of

1 Claim 19 (original): The method of claim 18 wherein the
2 upstream node is the head-end node.

1 Claim 20 (currently amended): A computer-readable medium
2 having stored thereon at least one network path
3 determination constraint expressed as a computer-executable
4 an-executable instruction, each computer-executable
5 executable instruction comprising:

- information concerning a first operand;
- information concerning a second operand; and
- an operation code,

9 wherein the computer-readable machine-readable
10 medium is a component of a first node of a communications
11 network, and

12 wherein the at least one network path
13 determination constraint is expressed as a

14 computer-executable ~~an executable~~ program including one or
15 more computer-executable instructions, and wherein the
16 computer-executable executable program was received in a
17 message from a second node of the communications network.

1 Claim 21 (previously presented): The computer-readable
2 medium of claim 20 wherein the operation code denotes an
3 operation selected from a group of operations consisting
4 of:

- 5 - bit-wise AND;
- 6 - bit-wise OR;
- 7 - bit-wise XOR;
- 8 - bit-wise equality;
- 9 - bit-wise inversion;
- 10 - Boolean AND;
- 11 - Boolean OR; and
- 12 - Boolean negation.

1 Claim 22 (previously presented): The computer-readable
2 medium of claim 20 wherein the information concerning
3 either of the first operand or the second operand is a
4 pointer to a register.

1 Claim 23 (previously presented): The computer-readable
2 medium of claim 22 wherein the register is a register that
3 contains a link attribute.

1 Claim 24 (previously presented): The computer-readable
2 medium of claim 22 wherein the link attribute is selected
3 from a group of link attributes consisting of:
4 - link type;
5 - maximum link bandwidth;

6 - maximum reservable link bandwidth;
7 - current bandwidth reservation;
8 - current bandwidth usage;
9 - link coloring;
10 - link administrative group;
11 - link delay;
12 - link media type;
13 - optical link wavelength;
14 - optical link minimum signal to noise ratio;
15 - optical link maximum power dispersion;
16 - optical link transmission power; and
17 - optical link receiver sensitivity.

1 Claim 25 (previously presented): The computer-readable
2 medium of claim 22 wherein the register is a register that
3 contains a node attribute.

1 Claim 26 (previously presented): The computer-readable
2 medium of claim 25 wherein the node attribute is selected
3 from a group of node attributes consisting of:
4 - node type;
5 - minimum node throughput;
6 - node quality of service support; and
7 - node queuing type.

1 Claim 27 (previously presented): The computer-readable
2 medium of claim 20 having further stored thereon at least
3 one network path determination constraint as a list of at
4 least one explicit node that is specified to be a part of
5 the network path.

1 Claim 28 (previously presented): The computer-readable
2 medium of claim 27 wherein the at least one explicit node
3 is one of a loose-hop node and a strict-hop node.

1 Claim 29 (currently amended): A network node comprising:
2 a) a plurality of registers including attribute
3 registers, the attribute registers storing attributes
4 of links in the network; and
5 b) a computer-readable machine-readable medium having
6 stored thereon at least one network path determination
7 constraint as an a computer-executable instruction,
8 each computer executable executable instruction
9 including
10 i) a first operand pointer,
11 ii) a second operand pointer, and
12 iii) an operation code,
13 wherein at least one of the first and second
14 operand pointers points to one of the attribute
15 registers, and
16 wherein the computer executable executable
17 instruction was received in a message from another
18 network node.

1 Claim 30 (original): The network node of claim 29 wherein
2 the plurality of registers further includes general purpose
3 registers,
4 wherein each of the attribute registers is a
5 read-only register, and
6 wherein each of the general purpose registers is
7 read/write register.

1 Claim 31 (currently amended): The network node of claim 29
2 wherein the computer-readable machine readable medium also
3 has stored thereon at least one network path determination
4 constraint as a list of at least one explicit node that is
5 specified to be a part of the network path.

1 Claim 32 (original): The network node of claim 31 wherein
2 the at least one explicitly specified node is one of a
3 loose-hop node and a strict-hop node.

1 Claim 33 (original): The network node of claim 29 wherein
2 the plurality of registers further include accumulation
3 registers storing cumulative attributes of a path.

Claims 34 and 35 (canceled)

1 Claim 36 (original): A method for processing, by a node of
2 a network, a message carrying at least one network path
3 determination constraint, the method comprising:

4 a) if the tail-end node of the path is in a part of
5 the network, the topology of which is not known by the
6 node, then performing a constraint-based path
7 determination to a next node selected from a group of
8 nodes consisting of

9 (i) an area border node, and
10 (ii) an autonomous system gateway node,

11 to generate a partial path; and

12 b) forwarding the message carrying the at least one
13 network path determination constraint to an adjacent
14 downstream node on the partial path.

1 Claim 37 (previously presented): A method for processing,
2 by a node of a network, a message from another node of the
3 network, the message carrying at least one network path
4 determination constraint, the method comprising:

- 5 a) if a next node specified in a list of explicit
6 nodes is a loose-hop node, then performing a
7 constraint-based path determination to the next
8 loose-hop node to generate a partial path; and
9 b) forwarding the message carrying the at least one
10 network path determination constraint to an adjacent
11 downstream node on the partial path,
12 wherein the at least one network path
13 determination constraint is expressed in the form of a
14 program including one or more executable instructions.

1 Claim 38 (previously presented): A method for processing,
2 by a node of a network, a message from another node of the
3 network, the message carrying at least one network path
4 determination constraint, the method comprising:

- 5 a) if the node cannot process any one of the at least
6 one network path determination constraint, performing
7 a constraint-based path determination to a node that
8 can process that one of the at least one network path
9 determination constraint, to generate a partial path;
10 and
11 b) forwarding the message carrying the at least one
12 network path determination constraint to an adjacent
13 downstream node on the partial path,
14 wherein the at least one network path
15 determination constraint is expressed in the form of a
16 program including one or more executable instructions.

1 Claim 39 (previously presented): A method for processing,
2 by a node of a network, a message from another node of the
3 network, the message carrying at least one network path
4 determination constraint, the method comprising:

- 5 a) if constraint processing has been delegated to
6 another network element, performing a constraint-based
7 path determination to the other network element to
8 which constraint processing has been delegated to
9 generate a partial path; and
10 b) forwarding the message carrying the at least one
11 network path determination constraint to an adjacent
12 downstream node on the partial path,

13 wherein the at least one network path
14 determination constraint is expressed in the form of a
15 program including one or more executable instructions.

1 Claim 40 (previously presented): A network node
2 comprising:

- 3 a) a path determination facility for performing a
4 constraint-based path determination to a next node
5 to generate a partial path;
6 b) a signaling facility for
7 i) receiving a message carrying at least one
8 network path determination constraint, and
9 ii) forwarding the message carrying the at
10 least one network path determination constraint
11 to an adjacent downstream node on the partial
12 path;
13 c) a process for generating a traffic engineering
14 database; and
15 d) a traffic engineering database generated by the
16 processing for generating,

17 wherein the path determination facility is further
18 adapted to determine at least a part of a path based
19 on

20 i) contents of the traffic engineering
21 database, and

22 ii) at least one path constraint received from
23 the signaling facility,

24 wherein, if the path determination facility
25 cannot determine a complete constraint-based path to a
26 specified tail-end node, then the path determination
27 facility performs a constraint-based path determination
28 to a next node selected from a group of nodes consisting
29 of

30 - an area border node,
31 - an autonomous system gateway node,
32 - a node that can process one of the at least
33 one network path determination constraint
34 carried by the message which cannot be
35 evaluated by the present node,
36 - a specified loose-hop node, and
37 - a node to which constraint processing is
38 delegated,

39 to generate a partial path, and
40 the signaling facility forwards a message carrying the at
41 least one path constraint to an adjacent downstream node
42 on the partial path.

1 Claim 41 (original): The routing facility of claim 40
2 wherein the path is a label-switched path.

Claims 42-52 (canceled)

1 Claim 53 (previously presented): The method of claim 5,
2 wherein the node is an intermediary node, and wherein the
3 act of performing a constraint-based path determination
4 includes determining whether a link from the node to the
5 next node specified in a first portion of the path
6 satisfies the set of at least one constraint.

1 Claim 54 (previously presented): A method for
2 processing, by a node of a network, a message carrying at
3 least one network path determination constraint, the
4 method comprising:

- 5 a) performing a constraint-based path determination
6 to a next node to generate a partial path;
- 7 b) forwarding the message carrying the at least one
8 network path determination constraint to an adjacent
9 downstream node on the partial path, wherein the
10 node is an intermediary node, and wherein the act of
11 performing a constraint-based path determination
12 includes determining whether a link from the node to
13 the next node specified in the first portion of the
14 path satisfies the set of at least one constraint;
15 and
- 16 c) if the link from the first intermediary node to
17 the next node specified in a first portion of the
18 path is determined to satisfy the set of at least
19 one constraint, then transmitting the received
20 message to the next node.

1 Claim 55 (previously presented): A method for
2 processing, by a node of a network, a message carrying at
3 least one network path determination constraint, the
4 method comprising:

- 5 a) performing a constraint-based path determination
6 to a next node to generate a partial path;
7 b) forwarding the message carrying the at least one
8 network path determination constraint to an adjacent
9 downstream node on the partial path, wherein the
10 node is an intermediary node, and wherein the act of
11 performing a constraint-based path determination
12 includes determining whether a link from the node to
13 the next node specified in the first portion of the
14 path satisfies the set of at least one constraint;
15 and
16 c) if the link from the first intermediary node to
17 the next node specified in a first portion of the
18 path is determined not to satisfy the set of at
19 least one constraint, then transmitting an error
20 message back to the source node.

Claims 56-59 (canceled)

1 Claim 60 (currently amended): A network node comprising:
2 a) a plurality of registers including attribute
3 registers, the attribute registers storing
4 attributes of links in the network; and
5 b) a computer-readable machine-readable medium
6 having stored thereon at least one network path
7 determination constraint as a computer-executable an

8 executable instruction, each computer-executable
9 executable instruction including
10 i) a first operand pointer,
11 ii) a second operand pointer, and
12 iii) an operation code,
13 wherein at least one of the first and
14 second operand pointers points to one of the
15 attribute registers, and
16 wherein the computer-executable executable
17 instruction was received in a message from another
18 network node, and
19 wherein the computer-readable machine-readable
20 medium further stores thereon a table including
21 i) a first entry representing a first
22 attribute of a node or link connected to the
23 node,
24 ii) a second entry representing an accumulated
25 value for a second attribute of a node or link
26 connected to the node, and
27 iii) a third entry storing a result of a
28 specified operation performed on one of the
29 first entry and the second entry.

1 Claim 61 (currently amended): A network node comprising:
2 a) a plurality of registers including attribute
3 registers, the attribute registers storing
4 attributes of links in the network; and
5 b) a computer-readable machine-readable medium
6 having stored thereon at least one network path
7 determination constraint as a computer-executable an

8 executable instruction, each computer-executable
9 executable instruction including
10 i) a first operand pointer,
11 ii) a second operand pointer, and
12 iii) an operation code,
13 wherein at least one of the first and
14 second operand pointers points to one of the
15 attribute registers, and
16 wherein the computer-executable executable
17 instruction was received in a message from another
18 network node, and
19 wherein the computer-readable machine-readable
20 medium further stores thereon a memory data structure
21 including
22 i) a first portion storing attributes of nodes
23 or links in the network,
24 ii) a second portion storing network-path
25 constraints, and
26 iii) a third portion storing
27 computer-executable instructions for performing
28 operations on the stored attributes and the
29 stored constraints; and further comprising:
30 c) a processor for executing the
31 computer-executable instructions stored in the third
32 portion of memory and computing a path in the
33 network based on results of the executed
34 computer-executable instructions.

Claim 62 (canceled)

1 Claim 63 (previously presented): The network node of
2 claim 6 wherein if constraint processing has been
3 delegated to another network element, then the path
4 determination facility further performs a
5 constraint-based path determination to the other network
6 element to which constraint processing has been delegated
7 to generate a partial path.

Claims 64-70 (canceled)

1 Claim 71 (previously presented): The method of claim 36
2 wherein each of the at least one network path determination
3 constraint is an executable instruction.

1 Claim 72 (currently amended): A method for processing, by
2 a node of a network, a message from another node of the
3 network, the message carrying at least one network path
4 determination constraint, the method comprising:

5 a) determining whether to delegate constraint
6 processing to another device; and
7 b) if it has been determined that constraint
8 processing has been delegated to another network
9 element, forwarding the message carrying the at least
10 one network path determination constraint to the other
11 device,

12 ~~The method of claim 70 wherein each of the at least one~~
13 ~~network path determination constraint is an executable~~
14 ~~instruction.~~

Claim 73-78 (canceled)

1 Claim 79 (previously presented): The method of claim 5,
2 wherein the program includes a plurality of executable
3 instructions.

1 Claim 80 (previously presented): The method of claim 6,
2 wherein the program includes a plurality of executable
3 instructions.

1 Claim 81 (previously presented): The method of claim 11,
2 wherein the program includes a plurality of executable
3 instructions.

1 Claim 82 (previously presented): The method of claim 37,
2 wherein the program includes a plurality of executable
3 instructions.

1 Claim 83 (previously presented): The method of claim 38,
2 wherein the program includes a plurality of executable
3 instructions.

1 Claim 84 (previously presented): The method of claim 39,
2 wherein the program includes a plurality of executable
3 instructions.